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(54) **TUNABLE SURFACE PLASMON DEVICES**

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(58) **Field of Classification Search** None
See application file for complete search history.

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(57) **ABSTRACT**

A tunable extraordinary optical transmission (EOT) device wherein the tunability derives from controlled variation of the dielectric constant of a semiconducting material (semiconductor) in evanescent-field contact with a metallic array of sub-wavelength apertures. The surface plasmon resonance wavelength can be changed by changing the dielectric constant of the dielectric material. In embodiments of this invention, the dielectric material is a semiconducting material. The dielectric constant of the semiconducting material in the metal/semiconductor interfacial region is controllably adjusted by adjusting one or more of the semiconductor plasma frequency, the concentration and effective mass of free carriers, and the background high-frequency dielectric constant in the interfacial region. Thermal heating and/or voltage-gated carrier-concentration changes may be used to variably adjust the value of the semiconductor dielectric constant.

17 Claims, 17 Drawing Sheets

